

CLAIMS

Having thus described the invention, what is claimed is:

1. A mechanical bending apparatus for bending flat workpieces (6) including at least one bending tool assembly (9, 9a) which has at least one tool part that can be moved by means of a bending tool drive (27, 27a) to bend the workpiece along a bending line (11) by being acted on by the movable tool part, said movable tool part comprising a multiplicity of adjacent segments disposed along the direction of the bending line (11), and each operatively connectable to the bending drive (27, 27A) to permit ready variation of the number of segments so connected and thereby the operative length of the movable tool part.

2. The mechanical bending apparatus in accordance with Claim 1 wherein the bending tool (9, 9a) is a swivelable bending tool with a movable tool part in the form of a bending cheek (14, 14a) that can swivel on a swivel axis (21) running in the direction of the bending line (11), and wherein the bending cheek (14, 14a) is comprised of a multiplicity of segments (17, 17a), at least some of which can be selectively connected to the bending tool drive (27, 27a) and can be swiveled on the swivel axis (21) when the drive connection is made to produce the bending action on the workpiece.

3. The mechanical bending apparatus in accordance with Claim 2 wherein at least some segments (17, 17a) of the bending cheek (14, 14a) are two-arm swivelable levers with a bending arm (19, 19a) provided on one side of the swivel axis (21) for acting on the workpiece and bending it, and with a drive arm (20, 20a) provided on the other side of the swivel axis (21) for selective connection to the bending tool drive (27, 27a).

4. The mechanical bending apparatus in accordance with Claim 3 wherein at least one swivelable lever can be engaged by a switching device (34) on the drive arm side in a recess (35) on a driver (36) of the bending drive (27a) or disengaged from that recess (35), whereby the connection between the swivelable lever and the bending drive (27a) is made in the engaged mode and is broken in the disengaged mode.

5. The mechanical bending apparatus in accordance with Claim 3 wherein there is included a control element (24) with a track (23) between at least some of said swivelable levers and the bending drive (27) and some swivelable levers are supported on the drive arm side on the track (23) of the control element (24), said swivelable levers being selectively connected to the bending drive on the bending tool drive side by a switching device, whereby, when the drive connection is made between the control element (24) and the bending tool drive (27), the swivelable lever is acted on by the track (23) of the control element (24) on the drive arm side and can thereby swivel about the swivel axis (21) to produce the bending action on the workpiece.

6. The mechanical bending apparatus in accordance with Claim 5 wherein the switching device for selectively connecting the control element (24) and the bending tool drive (27) has at least one coupling part (25) that can be selectively engaged and disengaged between the control element (24) and the bending tool drive (27), whereby the connection between the control element (24) and the bending tool drive (27) is made when the coupling part (25) is engaged and broken with the coupling part (25) is disengaged.

7. The mechanical bending apparatus in accordance with Claim 1 wherein the bending tool assembly (9, 9a) is swivelable and includes a hold-down device (15) extending along the bending line (11), so that the workpiece can be acted upon in its transverse direction and can thereby be fixed between the hold-down device (15) and a workpiece support (16) on the side of the workpiece opposite the hold-down device (15), said hold-down device (15) being comprised of a multiplicity of adjacent segments (18) disposed along the direction of the bending line (11), at least some of which can be selectively connected to a drive for the hold-down device (15) and can be moved into a position where they act on the workpiece by producing a drive connection to bend the workpiece with the segments (18) of the hold-down device (15) and segments (17, 17a) of the bending cheek (14, 14a) working together at the same time when the drive of the hold-down device (15) or the bending tool drive (27, 27a) are connected thereto.

8. The mechanical bending apparatus in accordance with Claim 1 wherein there are at least two swivelable bending tool assemblies (9), each of which has a bending cheek (14) that can swivel, with at least some segments (17) of the bending cheek (14) being selectively connectable to the bending tool drive (27) and a hold-down device (15), whereby the bending cheek (14) of one bending tool assembly and the hold-down device (15) of the other bending tool assembly (9) are arranged on the same side of the workpiece.

9. The mechanical bending assembly in accordance with Claim 8 wherein on at least on one side of the workpiece (6), the hold-down device (15) has a drive (30), and the bending tool drive (27) of the hold-down device (15) of the other bending tool assembly (9) have at least one common drive element.

10. A machine tool for bending panels on a flat workpieces (6), including:

- (a) at least one mechanical cutting device (39) for machine cutting bendable panels in the workpiece; and
- (b) at least one bending tool assembly (9, 9a) including at least one tool part that can be moved by means of a bending tool drive (27, 27a), to bend the workpiece along a bending line (11) by being acted on by the movable tool part, said movable tool part comprising a multiplicity of adjacent segments disposed a along the direction of the bending line (11), and each operatively connectable to the bending drive (27, 27A) to permit ready variation of the number of segments so connected and thereby the operative length of the movable tool part.

14. A machine tool for bending panels on a flat workpieces (6) in accordance with Claim 12 wherein there is included a control element (24) with a track (23) between at least some of said swivelable levers and the bending drive (27) and some swivelable levers are supported on the drive arm side on the track (23) of the control element (24), said swivelable levers being selectively connected to the bending drive on the bending tool drive side by a switching device, whereby, when the drive connection is made between the control element (24) and the bending tool drive (27), the swivelable lever is acted on by the track (23) of the control element (24) on the drive arm side and can thereby swivel about the swivel axis (21) to produce the bending action on the workpiece.

15. A machine tool for bending panels on a flat workpieces (6) in accordance with Claim 14 wherein the switching device for selectively connecting the control element (24) and the bending tool drive (27) has at least one coupling part (25) that can be selectively engaged and disengaged between the control element (24) and the bending tool drive (27), whereby the connection between the control element (24) and the bending tool drive (27) is made when the coupling part (25) is engaged and broken with the coupling part (25) is disengaged.

11. A machine tool for bending panels on a flat workpieces (6) in accordance with Claim 10 wherein the bending tool (9, 9a) is a swivelable bending tool with a movable tool part in the form of a bending cheek (14, 14a) that can swivel on a swivel axis (21) running in the direction of the bending line (11), and wherein the bending cheek (14, 14a) is comprised of a multiplicity of segments (17, 17a), at least some of which can be selectively connected to the bending tool drive (27, 27a) and can be swiveled on the swivel axis (21) when the drive connection is made to produce the bending action on the workpiece.

12. A machine tool for bending panels on a flat workpieces (6) in accordance with Claim 11 wherein at least some segments (17, 17a) of the bending cheek (14, 14a) are two-arm swivelable levers with a bending arm (19, 19a) provided on one side of the swivel axis (21) for acting on the workpiece and bending it, and with a drive arm (20, 20a) provided on the other side of the swivel axis (21) for selective connection to the bending tool drive (27, 27a).

13. A machine tool for bending panels on a flat workpieces (6) in accordance with Claim 12 wherein at least one swivelable lever can be engaged by a switching device (34) on the drive arm side in a recess (35) on a driver (36) of the bending drive (27a) or disengaged from that recess (35), whereby the connection between the swivelable lever and the bending drive (27a) is made in the engaged mode and is broken in the disengaged mode.

16. A machine tool for bending panels on a flat workpieces (6) in accordance with Claim 10 wherein the bending tool assembly (9, 9a) is swivelable and includes a hold-down device (15) extending along the bending line (11), so that the workpiece can be acted upon in its transverse direction and can thereby be fixed between the hold-down device (15) and a workpiece support (16) on the side of the workpiece opposite the hold-down device (15), said hold-down device (15) being comprised of a multiplicity of adjacent segments (18) disposed along the direction of the bending line (11), at least some of which can be selectively connected to a drive for the hold-down device (15) and can be moved into a position where they act on the workpiece by producing a drive connection to bend the workpiece with the segments (18) of the hold-down device (15) and segments (17, 17a) of the bending cheek (14, 14a) working together at the same time when the drive of the hold-down device (15) or the bending tool drive (27, 27a) are connected thereto.

17. A machine tool for bending panels on a flat workpieces (6) in accordance with Claim 10 wherein there are at least two swivelable bending tool assemblies (9), each of which has a bending cheek (14) that can swivel, with at least some segments (17) of the bending cheek (14) being selectively connectable to the bending tool drive (27) and a hold-down device (15), whereby the bending cheek (14) of one bending tool assembly and the hold-down device (15) of the other bending tool assembly (9) are arranged on the same side of the workpiece.

18. A machine tool for bending panels on a flat workpieces (6) in accordance with Claim 17 wherein on at least on one side of the workpiece (6), the hold-down device (15) has a drive (30), and the bending tool drive (27) of the hold-down device (15) of the other bending tool assembly (9) have at least one common drive element.